

AMENDMENTS TO THE CLAIMS

A detailed listing of all claims that are, or were, in the present application, irrespective of whether the claim(s) remains under examination in the application are presented below. The claims are presented in ascending order and each includes one status identifier. Those claims not cancelled or withdrawn but amended by the current amendment utilize the following notations for amendment: 1. deleted matter is shown by strikethrough; and 2. added matter is shown by underlining.

1. (Currently Amended) A method of seismic exploration which comprises: generating a seismic event; applying the seismic event to the earth's surface[[(13)]]; detecting a response to the event, the detected response including P-waves and S-waves in the earth's surface[[(13)]]; and analysing the detected response; and in which: the detecting step comprises monitoring and recording the response to the seismic event in the form of movements of particles at the earth's surface[[(13)]], from a position spaced from the earth's surface[[(13)]], the detecting step being carried out over a response period, the response period being a predetermined period of time after the seismic event; and the analysing step comprises analysing the movements of particles at the earth's surface[[(13)]] in the recorded response to the seismic event during the response period.

2. (Original) A method as claimed in Claim 1, in which the movements of the particles are monitored using light, in the form of visible light, x-rays, UV light or IR light, or using another form of radiation including radio waves, radar, sonar or using acoustic waves.

3. (Currently Amended) A method as claimed in Claim 1 ~~or Claim 2~~, in which the monitoring is carried out using monitoring apparatus[[(14)]] which is moved relative to the earth's surface[[(13)]] during the response period.
4. (Original) A method as claimed in Claim 3, in which the analysing step includes the elimination from the detected response of noise caused by the relative movement of the monitoring apparatus.
5. (Currently Amended) A method as claimed in Claim 1 ~~or Claim 2~~, in which the monitoring is carried out using monitoring apparatus[[(32)]] which is kept stationary during the response period and is then moved to a different position after the response period, and the method is then repeated.
6. (Currently Amended) A method as claimed in Claim 3 ~~any of Claims 3 to 5~~, in which the monitoring apparatus comprises several monitoring devices[[(14)]] which are used simultaneously at different locations.
7. (Currently Amended) A method as claimed in Claim 1 ~~any preceding Claim~~, in which the response is transformed to and recorded in digital form.
8. (Currently Amended) A method as claimed in Claim 1 ~~any preceding Claim~~, in which the analysing step comprises analysing surface particle displacements and/or velocities and/or accelerations.

9. (Currently Amended) A method as claimed in Claim 2~~any of Claims 2 to 8~~, in which the monitoring apparatus comprises three sources of coherent mono frequency light directed at the surface area being monitored, and a receiver for reflected coherent light, or a single source of coherent light and three receivers.
10. (Original) A method as claimed in Claim 9, in which the coherent light and a reference beam are used to make speckle patterns by means of interferometry, and changes in the speckle patterns are analysed in the analysing step.
11. (Currently Amended) A method as claimed in Claim 2~~any of Claims 2 to 8~~, in which the monitoring apparatus[[(14)]] comprises video recording apparatus.
12. (Original) A method as claimed in Claim 11, in which the video recording apparatus includes one or more cameras operating on the basis of visible light.
13. (Currently Amended) A method of marine seismic exploration, as claimed in Claim 1~~any preceding Claim~~, and in which the earth's surface is the sea bed[[(13)]], the seismic event is applied to the sea or directly to the sea bed and the monitoring apparatus[[(14)]] is spaced above the sea bed.
14. (Original) A method as claimed in Claim 13, in which the monitoring apparatus is located from 0.5 to 5 metres above the sea floor during the response period.
15. (Currently Amended) A method as claimed in Claim 13~~or Claim 14~~, in which the monitoring apparatus[[(14)]] additionally comprises a hydrophone.

16. (Currently Amended) A method as claimed in Claim 13~~any of Claims 13 to 15~~, in which the monitoring apparatus is either towed or is self-propelled and the analysing step includes the elimination from the detected response of noise representing disturbances caused by the motion of the monitoring apparatus.

17. (Currently Amended) A method as claimed in Claim 13~~any of Claims 13 to 16~~, in which the particles whose movements are detected are sand particles on the sea floor[[(13)].

18. (Currently Amended) A method as claimed in Claim 13~~any of Claims 13 to 17~~ in which the seismic event comprises a seismic wave having a wavelength in the range 5 to 100 m and a duration of up to 3s.

19. (Currently Amended) A method as claimed in Claim 13~~any of Claims 13 to 18~~ in which the response period is from 4 to 8 seconds.

20. (Currently Amended) A method as claimed in Claim 13~~any of Claims 13 to 19~~, in which the monitoring apparatus comprises a plurality of monitoring devices[[(22)]] mounted on a plurality of cables, the monitoring devices on each cable being spaced from each other by a distance which is less than the wavelength of the transmitted seismic event.

21. (Currently Amended) Apparatus for carrying out seismic exploration which comprises: means for generating a seismic event[[(12)]]; means for applying the seismic event to the earth's surface; detecting apparatus[[(14)]] for detecting a response to the event including P-waves and S-waves in the earth's surface[[(13)]]; and means for analysing the detected response; and in which: the detecting apparatus[[(14)]] comprises monitoring

apparatus and recording apparatus arranged to monitor and record the response to the seismic event in the form of movements of particles at the earth's surface[[(13)]], from a position spaced from the earth's surface[[(13)]], over a predetermined response period after the seismic event.

22. (Currently Amended) Apparatus as claimed in Claim 21, in which the monitoring apparatus[[(14)]] uses light, in the form of visible light, x-rays, UV light or iv light or uses another form of radiation including radio waves, radar, sonar or uses acoustic waves.

23. (Currently Amended) Apparatus as claimed in Claim 21~~any of Claims 21 to Claim 23~~, in which the monitoring apparatus[[(14)]] is movable relative to the earth's surface during the response period.

24. (Currently Amended) Apparatus as claimed in Claim 21~~or Claim 22~~, in which the monitoring apparatus[[(14)]] is capable of being kept stationary during the response period and then moved to a different position after the response period.

25. (Currently Amended) Apparatus as claimed in Claim 21~~any of Claims 21 to Claim 24~~, in which the monitoring apparatus comprises several monitoring devices[[(22)]] which are used simultaneously at different locations.

26. (Currently Amended) Apparatus as claimed in Claim 21~~any of Claims 21 to 25~~, in which the monitoring apparatus[[(14)]] comprises three sources of coherent light arranged to be directed at the area being monitored, and a receiver for reflected coherent light.

27. (Currently Amended) Apparatus as claimed in Claim 21~~any of Claims 21 to 25~~, in which the monitoring apparatus[[(14)]] comprises video recording apparatus and the recorded response is a visual record.

28. (Currently Amended) Apparatus for marine seismic exploration, as claimed in Claim 21~~any of Claims 21 to 27~~, and in which: the earth's surface is the sea bed[[(13)]], the seismic event is arranged to be applied to the sea or directly to the sea bed and the monitoring apparatus[[(14)]] is arranged to be spaced above the sea bed[[(13)]].

29. (Original) Apparatus as claimed in Claim 28, in which the detecting apparatus additionally comprises a hydrophone.

30. (Currently Amended) Apparatus as claimed in Claim 28~~or Claim 29~~, in which the detecting apparatus is either arranged to be towed by a vessel or is self-propelled.

31. (Currently Amended) Apparatus as claimed in Claim 21~~any of Claims 21 to 30~~, in which the detecting apparatus comprises a plurality of monitoring devices[[(22)]] mounted on a plurality of cables, the monitoring devices on each cable being spaced from each other by a distance which is less than the wavelength of the transmitted seismic event.

32. (Currently Amended) A method of producing a seismic survey report of a region, which comprises: carrying out a method as claimed in Claim 1~~any of Claims 1 to 20~~; deriving from the analysing step, representations of subsurface layers; and assembling the representatives as a depiction of the geological structure of the region.

33. (New) Apparatus for analyzing a seismic event producing P-waves and S-waves by monitoring movements of particles located on the earth's surface, the particle movement being induced by the seismic event, comprising:

a camera system having a plurality of coherent light sources arranged to be directed at monitored particles on the earth's surface, and a receiver arranged to receive light reflected from the monitored particles, the plurality of light sources adapted and arranged to create speckle patterns;

a video recording apparatus operably coupled to the camera system; and

a processing unit operably coupled to the camera system and adapted to determine 3D-particle velocity of the monitored particles from the speckle patterns.